

Non Pesticidal Management of Insect Pests

- Dr. G.V. Ramanjaneyulu ¹

Today agriculture is passing through a difficult phase. The ever increasing costs of cultivation due to excessive dependency on the external inputs, high fluctuations in market prices due to opening of up of markets, reduced public support after liberalisation coupled with the monsoon vagaries have made agriculture based livelihoods unviable. The spate of farmers suicides particularly in Andhra Pradesh and across the country are only the tip of the ice berg. The crisis needs to be understood and several long term initiations have to be made to solve it.

Agriculture chemicals especially pesticides occupy major costs in crops like cotton, chillies etc. The inevitability of pesticides in agriculture is promoted by the industry as well as the public research and extension bodies.

The dominant paradigm of pest management largely depends on chemical pesticides. Pesticide sprays are resorted to when the pest is in a damaging stage [in terms of the pest life cycle] and state [in terms of intensity of incidence]. However pesticides being used become ineffective in no time since such a use allows for insects to be selected for genetic resistance rather than controlling them. On the other hand, replacing chemical products by biological products by itself may not solve the problem without a fundamental change in the perspective or thinking towards pest management. The Integrated Pest Management initiatives which have come up as alternative though largely debates about pesticide effects on human health and on environment still believe that pesticides are inevitable, at least as a last resort. The 'alternatives' are now commercialised by the market. One such alternative which has much serious consequence is the genetically engineered crops which are released as well lined up for release. The new markets not only sell the alternate products, but also dictate the methods to be adopted [organic farming certification standards, for example].

A midst the dominant scenario a small village called 'Punukula' in Khammam dist of AP has a different story to tell. The village, with around 600 acres under cotton and growing crops like chilli, pigeonpea, paddy, could emerge out of the pesticide trap with efforts put in by non-governmental organisations. The costs of cultivation came down by more than Rs. 10,000 per acre saving a staggering amount of about Rs. 60 lakhs on pesticide bill per annum in the village. This is not just another story of traditional practices but an interesting transformation of how farmers consolidated their knowledge supplemented with modern science, developed their skills, put their labor to effective use and by making best use of nature's products and processes, could replace the external inputs. The village today is completely free of pesticides. Farmers have been able to clear their earlier debts and the general sense of well-being in the village is an indication of the transformation. This village has already caught the attention of various state and national media. In next few pages one can see a passionate case of this village where the farmers say 'Throw out pesticides-pests will be controlled' contrary to what the dominant paradigm thinks and promotes.

Under Non-Pesticidal Management, the primary focus is on replacing the external inputs with the local knowledge, management skills, labour, and effective utilisation of natural products and processes locally available. The farmers understand the pest biology and life cycle and modify the crop management practices to keep the insect population under check, from reaching a pest status.

In the four stages of the life cycle, insects damage the crop only in one stage [larval stage in most of the cases] – atleast two of the stages are immobile [egg and pupa].

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The adult stage will not be on the crop. There are several options available to control them at each of the stages mostly using local resources.

All these doesn't require the so called 'expertise' but only accepting and respecting the know ledge and skills of the farmers, supporting them to enhance their know ledge base w ith the demystified modern science.

The dominant paradigm which still by and large tries to find solutions in marketable technologies and commodities have to change. The public policy support which encourages such commodities has to change. The research system which has already set its agenda to work and promote on such technologies should reorient its priorities and work tow ards more farmer friendly methods and technologies. A shift in the mindset, a shift in the perspectives of thinking is needed.

What this calls for is a shift in the pest management paradigm currently being adopted.

Shifting Paradigms:

Myths	Realities
Pests can be controlled only by killing them	this is the gravest mistake that the current pest management paradigm makes – it believes that pests can be controlled only by killing them. The pesticides and pesticide incorporated plants (for eg. Bt cotton) are based on this wrong premise. They all act only on larval stage when the damage already starts happening. A pest outbreak is waited for, after which powerful pesticides are brought in. This is only a “curative” attempt rather than a “preventive success”.
All insects in the field are pests	there is an indiscriminate outlook towards the various insects that are present in an agricultural field and around it. Even though the modern science is talking about the natural enemies the pesticides they produce and promote kills all the insects indiscriminately. This obviously destroys the natural predators of the pests also. When the ecological balance is thus destroyed, the pesticide-resistant pests take over
No relationship exists between mono-culture and pest incidence	the current pest management paradigm either does not appreciate or chooses to ignore the relationship between monocultures and pest incidence. It is well-established that such mono-cropping over large contiguous areas, reduced genetic base with mono-culturing germplasm results in an unobstructed proliferation of the pest. Now with the Pesticide incorporated plants have made these monocultures to gene level, trying to put 'Cry genes' against all pests across crops
Chemical fertilisers and pest incidence are not related	though it is scientifically known that a plant's vulnerability to pest incidence is higher with the use of chemical fertilisers (due to increased 'succulence' in the plant), the connection is not made in real life. Pests are sought to be dealt with in isolation to the land fertility management issues. This is a classic example of the reductionist views that modern science can take
Pest resistance is a genotypic issue rather than an environmental one	there is much research going on to develop varieties of plants that are pest-resistant by playing around with the genes. The game plan is obvious here – genes will go hand and in hand with intellectual property rights, which in turn ensure secure

	markets and profits for the industry. Pest resistance therefore is made a genotypic issue rather than one that involves broad ecological management in the farm. That is where Genetic Engineering in agriculture also finds its space. In this narrow perspective, what is not understood is that the problem only gets accentuated especially in pest-resistant GE crops when other environmental factors related to the pest's life cycle etc., are not managed
Resistance management is about using newer and newer generation pesticides [as per the industry], and "about using more pesticides, including mixtures of upto five pesticides" [as per the farmers]	The way to get around the problem of resistance is usually seen in inventing newer and newer molecules by the industry. In a patent regime, such newly developed pesticides mean more profits through secure markets. First came the OCs [organochlorines], followed by the OPs [organophosphates] and Carbamates, followed by the much-touted Synthetic Pyrethroids. Each generation's problems were sought to be solved by the next generation, only to end up by creating more problems. The cost went on increasing for the farmers. A 100 ml. pesticide of the newest generation can cost upto Rs 1000/ per container. The industry continues to grow at 4-5% per annum. However, the older molecules which were found to be problem-causing or ineffective were not removed from the scene. For some farmers, the way out is to mix four to five different pesticides and spraying them together – no one knows the ecological and health disaster that such desperate measures might be causing!
Prevention of pest/disease incidence is about spraying pesticides even when the pest is not present	Farmers in many parts of the country have made pesticide spraying a part of their daily routine – they take a tanker on their back to go and spray pesticides in their fields...."just in case". Pesticide use is no longer related to a pest and its manifestation in the field. Prevention is understood as spraying regularly, as per a schedule drawn up by the farmer or his industry-advisor irrespective of whether such treatment is needed or not
The benefits from the use of synthetic pesticides outweigh the risks	Finally, it is genuinely believed by many in the scientific establishment and the industry that the benefits from the use of synthetic pesticides outweigh the risks and problems associated with it. However, this is simply not true. It might appear to have an advantageous cost-benefit ratio given their simplistic and reductionistic economic calculations. In fact, the suicides in the cotton belts of the country prove that even the economics has turned adverse with pesticides. However, complete calculations of the entire social, economic and ecological disaster that pesticides have created, especially in the face of safer alternatives, instructs us that the risks and hazards far outweigh any probable benefits

The message is clear- 'Nature makes insects, men make them pests'

Some suggestions

- the NPM technology requires people to work collectively for the best results – one or two isolated attempts will not be optimal
- since the cost of crop protection through pesticides for most crops is upto 30-40% of the total cost of cultivation, if you reduce the use of pesticides, it is a great profit for the farmers
- deep summer ploughing is very important – this not only destroys the initial stages of a pest, but takes care of water and moisture conservation
- weeding is very important for a crop and this has to be timely
- quality of seed used is also a very critical parameter and farmers should be careful about the seed they use
- applying organic manures and matter in the soil is very useful – while this takes care of building soil structure and adding fertility, it also helps in moisture retention; chemical fertilisers are usually thought to add to the yields and are applied indiscriminately. These in turn increase the pest incidence on the crop
- starting to spray pesticides as soon as one spots one or two pests is a wrong approach – a farmer should be able to assess whether pests are above or below a particular threshold level before resorting to some mechanism to control them
- natural enemies should be allowed to grow in the fields by keeping it non-chemical
- store around 40 to 50 kilos of neem seed in the right season. There are many uses for it and you can use it as and when you need. Firstly, preparing neem extracts etc., is not a bothersome process [no smell etc.]; it can be prepared at home; and it does not involve great costs for the farmer. Neem leaves can be used for grain storage later on
- 3% neem oil is also good for certain pests
- neem cake application to the soil is good – it not only controls pests but also adds nitrogen
- similarly, chilli-garlic extract can be prepared at home and does not cost much
- cow urine and dung extract has both pest repellent qualities as well as growth regulation abilities
- different virus extracts can also be prepared by women and sold to others as an Income Generation Activity, as is happening in a few places at present
- Village level production of some of these materials, with the Panchayat as the node overseeing this is an important approach

- Dr. M. S. Chari, Managing Trustee, CSA

Therefore approach that needs to be taken towards pest management, to ensure economic, ecological and social benefits to farmers is completely different from the above, of course.

Such an alternative non-pesticidal approach recognises the importance of the following:

- that natural insect balances in a farm are important to control what we consider as 'pests'. For this to happen, the fields cannot be in a toxic-contaminated state
- that pest life cycles have to be understood and pest management has to begin right from the beginning – before the eggs are laid. Several steps along the way at each stage are needed. This understanding includes close pest surveillance and decisions based on the incidence
- that crop diversity plays an important role in pest management; in that sense, seeds play an important role and therefore, control over seeds by the farm communities. Trap crops and repellent crops have a role to play too
- that local and naturally-occurring materials can be used for pest control; this will also have its own political-economy dimensions which are of benefit to the farmers
- that since many of the pests are polyphagous, these pest management principles have to be applied across different crops and at a particular scale, for maximum benefits
- that soil nutrient management in organic ways plays a crucial role in the plant's ability to withstand pest and disease incidence
- that a new paradigm of pest management can not only benefit the farmers economically and ecologically but can also address certain developmental and social issues including gender
- that such pest management need not result in decreased yields, as it is usually made out to be
- that such pest management principles and practices are pretty often drawn from farmers' experiential knowledge